We already have the best system. Now it is even one of the most compact.

CleanBallast®
The RWO Type Approved Ballast Water Treatment System
Prepared for the Future

Inactivation or removal of organisms from ballast water to match the regulations

For many years the discharge of untreated ballast water in the port of destination has caused serious ecological and economic damage, as well as substantial harm to public health. Organisms in ballast water find themselves in a foreign environment, one where the absence of their natural enemies means they can multiply rapidly and threaten the ecological balance. With the adoption of the Convention on Ballast Water Management the International Maritime Organization (IMO) has reacted to the problem, which has been known of for many years. In the future, ballast water must be treated to reduce the number of discharged living organisms to a minimum.

A state-of-the-art compact solution

RWO’s CleanBallast® system is one of the very few ballast water treatment technologies that can withstand the uncertainties of the future. Its two-stage treatment principle consists of the proven in-depth disk-filtration technology combined with our advanced electrochemical disinfection – and guarantees a rapid and reliable handling of ballast water. The efficient removal of the sediments not only considerably lowers tank-cleaning costs, but also prevents the loss of valuable load capacities and furthermore leads to fuel savings.

The filters in CleanBallast® were generously sized, and with the extremely positive operational experiences with CleanBallast to date and in our continual product development we found that a somewhat reduced filter surface would not hurt the shipboard performance. Accordingly, we have optimised the Disk-Filter configuration and now right-sized the filter capacity with the experience gained, thereby reducing the number of filter housings and leading to a reduced footprint and further important benefits.

This optimisation has received official approval by BSH.

New Standards for Ballast water
The Performance Standard D-2 of the IMO requires that ships shall discharge:

- < 10 viable organisms per cubic metre ≥ 50 µm in minimum size
- < 10 viable organisms per millilitre < 50 µm and ≥ 10 µm in minimum size
- Indicator microbes: Vibrio cholerae < 1 cfu per 100 ml or 1 gr zooplankto E. coli < 250 cfu* per 100 ml Intestinal Enterococci less than 100 cfu* per 100 ml
  *colony forming unit
Simple, safe, efficient and reliable

RWO has developed the modular CleanBallast technology, which reliably removes organisms, sediments and suspended solids in just two steps. These are the DiskFilters for filtration of particles, sediment and organisms larger than 55µm when taking in ballast water, followed by the advanced electrochemical disinfection unit EctoSys® to efficiently disinfect the remaining smaller organisms and bacteria before the water reaches the ballast water tanks.

During the ship's voyage to the next port of call, a regrowth of organisms in the ballast water tank may occur. To assure a constant quality of the discharged water, the CleanBallast system is thus used during de-ballasting again, whereas the Disk-Filter system is bypassed and only the EctoSys® disinfection is required at de-ballasting. This assures a disruption-free and clean water cycle – from ballasting to de-ballasting – regardless of river, brackish or seawater. Depending on the ballast water pump capacity, the numbers and diameter of parallel working DiskFilters and the numbers of parallel working EctoSys® will be defined by RWO’s experts.

The performance and reliability of the CleanBallast system were tested under varying operational conditions such as different flow rates and challenging water quality, e.g. in polluted harbour water. Designing for and testing in this way enabled us to create the conditions for a rapid intake of ballast water and for short berthing times in harbour. The efficient removal of sediment also ensures that both the cost of tank cleaning and the loss of cargo capacity are substantially reduced.
CleanBallast
Product designed for and tested in real life conditions

Uptake
Particles, sediments and organisms that are larger than 55 μm are separated by means of mechanical filtration in the DiskFilter. This is followed by the advanced EctoSys® electrochemical disinfection cell, which further reduces the number of living organisms and disinfects the water before it reaches the ballast water tanks.

Discharge
Natural regrowth and reproduction of any remaining organisms in the treated water in the ballast water tanks is possible during the voyage. Therefore, prior to discharge the ballast water is treated a second time by the EctoSys® disinfection cell, to ensure that the performance standard D-2 as set by the IMO is met.
Advanced mechanical separation

Highly effective and proven DiskFilter technology

The DiskFilter combines the advantages of in-depth filtration with those of a screen filter and is therefore the most effective solution for treating waters of different and heavy loads at exactly defined filtration grades. The filtration is carried out by a number of individual filter discs, which are corrugated on the top and the bottom. This fast and efficient system ensures maximum net ballast water production even at higher sediment loads.

On the basis of the extremely positive operational experiences with CleanBallast the design of the disk filter section was further optimised in July 2012. This providing again a much smaller footprint.

Filtration process

During ballast water uptake the raw ballast water is pumped evenly into the parallel working DiskFilters. Each DiskFilter is equipped with a series of thin plastic filter discs, which are stacked on several spines. The hydraulic and spring supported forces press the grooved discs together. While filtered water passes through the discs, particles, fibres, algae etc., are retained on the outside surface of the discs and in the grooves.

Backflush process

When a predefined differential pressure is reached the fully-automatic backflushing mode starts. The spring that compresses the discs in the filtration phase is automatically released by the pressure of the flushing water (treated ballast water) and thereby eases the compression of the filter discs. Flushing water then flows from the cores of the elements to the peripheral ends of the filter discs and sets them into rotation, which guarantees a very short and effective backwashing of the filter in only a few seconds.

- Efficient and high ballast water production even at higher sediment loads
- Modular design, individual installation, skid-mounted or containerised version
- Easy, automatic operation, requiring no special tools or training
- Proven DiskFilter technology (> 8,000 references)
- No flow interruption during backflush and low pressure loss
Advanced electrolysis disinfection

The EctoSys® solution

The EctoSys® disinfection technology is an extremely efficient and robust system working both in seawater and low salinity water. It provides a reliable and sustainable disinfection of the ballast water in an economical, ecological and operator-friendly way.

By applying electricity to the special electrodes arranged in the cell, disinfectants are produced from the water directly in the piping. Due to the chemical and electrochemical properties of the electrodes used, they produce – among other disinfectants – very short-living and reactive hydroxyl (OH) radicals* which eliminate bacteria and organisms.

EctoSys® also stands out for fulfilling its function in waters with higher salt content, meaning in sea and brackish water, and also in water with low salt content, whereby it differs greatly from standard chlorine electrolysis.

In water with low salinity, the EctoSys® unit produces only hydroxyl radicals as active substances. The produced hydroxyl radicals have an extremely short lifetime and therefore give no response to Total Residual Oxidant analysis.

If brackish water or seawater is treated, the produced active substances are short-living hydroxyl radicals and chlorine/bromine. The residual disinfectants chlorine and bromine can be analysed as Total Residual Oxidant (TRO).

- Low power consumption 0.006 – 0.06 kWh/m³
- Operation and maintenance friendly
- Also working in low salinity water
- Minimum footprint < 1 m² (500 m³/h)
- No contact time required
- Safe for crew and vessel
- No increase of corrosion

*OH radicals are extremely reactive and having highest oxidation potential, meaning no waiting time but at the same time also no increase of corrosion.
EctoSys® disinfection
Modular system

One system – many possibilities

RWO’s CleanBallast system can easily be integrated into existing on-board processes and systems. The modular design means that the CleanBallast system and its components can be arranged to suit the available space and piping layout of ballast water systems. This is true for most pump capacities and ship types, and both for new building and retrofitting. Using our experience we have designed modular filtration units to enable different capacities and arrangements to be accommodated.

- Modular and flexible
- Best use of available footprint
- Easy for retrofitting
- Modular system to cover all capacity ranges
Some installation examples

Modular system to cover all capacity ranges
Steve Dawson, Director of Ship Management

„With legislation and the focus on environmental protection it is of paramount importance we have an effective ballast treatment system in operation. RWO have provided us with such systems and we are very pleased with both it’s performance and their support“.
Mr. Akihiko Masutani, Project Manager of SHI-ME

"Besides its very low energy consumption, high product quality and simple system configuration, its disinfection performance in low conductivity water without dosing chemicals and no risk of re-growth of organism during voyage are the reasons SHI-ME decided applying CleanBallast. In addition, CleanBallast also works in intermittent operation or even in turbid water and has a number of further positive features."

Mr. Akihiro Shirai, Deputy General Manager of SHI-ME

"RWO’s long time experience in the marine water treatment business field and its excellent technical background will promise us good future and mutually beneficial relationship."
Partner to the marine industry – for more than 35 years

Innovative technologies

In this increasingly competitive world, RWO Marine Water Technology maintains its distinctive image as an innovative company in design and implementation of new cost-efficient marine water and wastewater treatment solutions; whether onboard ships or offshore installations, for new building as well as retrofitting.

German know-how and quality

Active in this global business since 1975, RWO products are developed and manufactured today in our modern company headquarters in Bremen, Germany. Working in an ISO9001:2008 controlled environment, we cover any kind of water treatment application to be found on board ships and offshore rigs. RWO is the leading supplier of Oily Water Separators for any kind of ships worldwide and one of the frontrunners in ballast water treatment.

Worldwide Availability

RWO’s network of more than 50 qualified sales/service stations established throughout the world ensures customer benefits from short communication links and rapid response times. Thus, our wide-ranging know-how and products, as well listening to and catering for customers’ needs, have established us as the reliable partner in the maritime economy.
CleanBallast® Advantages at a Glance

- Low life cycle costs
- High system reliability
- Ideally also for ports with lower salt content
- Low maintenance requirement
- Simple operation
- No increase in corrosion and no effect to coatings
- Ease of implementation

Worldwide sales, service and technical support - RWO is your ideal partner for all aspects of water and wastewater treatment on board ships and offshore installations.
Our qualified employees will be pleased to introduce the technology to you and answer questions:

RWO GmbH
Thalenhorststrasse 15A
D-28307 Bremen/Germany

www.rwo.de
sales.rwo@veoliawater.com
tel. +49 421 53705 0
fax +49 421 53705 440
No increase in corrosion and no effect to coatings

During the Type Approval process of CleanBallast, RWO pioneered the area of corrosion studies with ballast water treatment systems. The extensive test program carried out, partly set the course for future studies and recommendations by international administrative authorities. The tests included accelerated comparative studies (treated and untreated sea water) using both uncoated steel test specimens but more importantly test specimens with 2-coat paint systems according to NORSOK Coating 3B approved according to DNV Classification Note 33.1 class B1, common and approved for use in BW tanks. The tests were also accelerated, i.e. the exposure of the test panels were set to simulate an approximate whole lifetime of a BW tank/piping system, regarding initial maximum concentration of TRO and natural decay.

Based on the result of these tests the independent test institutes concluded that there are no additional corrosive properties of seawater treated with CleanBallast, compared to untreated seawater. Thus, the tests proved that the CleanBallast equipped with the EctoSys® disinfection unit does not increase corrosion in ballast water tanks. CleanBallast is further certified and classified by the GL as compatible with epoxy based ballast water tank coating systems.